Supplementary Information

Tree height and hydraulic traits shape growth responses across droughts in a temperate broadleaf forest

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List of Tables

List of Figures

While there were several R-packages we used for a specific purpose in our methods, numerous packages were immensely helpful for this research behind the scenes. As in all of science, this study is a representation of the work done by both the authors of this paper as well as countless others. While acknowledging everyone is impossible, we want to at least give thanks to those who made this work possible.

R-packages not already cited in the main manuscript include the following, listed alphabetically by corresponding package name:

(R Core Team 2020; **???**; Xie 2020; Allaire et al. 2020; Wickham 2019)

Table S1: Species-specific bark thickness regression equations

Species	Equations	R^{2}
Carya cordiformis	ln[B]=-1.56+0.416*ln[DBH]	0.226
Carya glabra	ln[B]=-0.393+0.268*ln[DBH]	0.040
Carya ovalis	ln[B]=-2.18+0.651*ln[DBH]	0.389
Carya tomentosa	ln[B]=-0.477+0.301*ln[DBH]	0.297
Fagus grandifolia	ln[B]=1*ln[DBH]	
Fraxinus americana	ln[B]=0.418+0.268*ln[DBH]	0.256
Juglans nigra	ln[B]=0.346+0.279*ln[DBH]	0.246
Liriodendron tulipifera	ln[B]=-1.14+0.463*ln[DBH]	0.545
Quercus alba	ln[B]=-2.09+0.637*ln[DBH]	0.603
Quercus prinus	ln[B]=-1.31+0.528*ln[DBH]	0.577
Quercus rubra	ln[B]=-0.593+0.292*ln[DBH]	0.087

Table S2: Species-specific height regression equations

Species	Equations	R^{2}
Carya cordiformis	ln[H] = 0.332+0.808*ln[DBH]	0.874
Carya glabra	ln[H] = 0.685+0.691*ln[DBH]	0.841
Carya ovalis	ln[H] = 0.533+0.741*ln[DBH]	0.924
Carya tomentosa	ln[H] = 0.726+0.713*ln[DBH]	0.897
Fagus grandifolia	ln[H] = 0.708+0.662*ln[DBH]	0.857
Liriodendron tulipifera	ln[H] = 1.33+0.52*ln[DBH]	0.771
Quercus alba	ln[H] = 0.74+0.645*ln[DBH]	0.719
Quercus prinus	ln[H] = 0.41+0.757*ln[DBH]	0.886
Quercus rubra	ln[H] = 1.00+0.574*ln[DBH]	0.755
all	ln[H] = 0.839+0.642*ln[DBH]	0.857

Table S3: Palmer drought severity index (PDSI) by month for focal droughts. Rank refers to

year	month	PDSI	rank
focal droughts			
1966	May	-2.98	2
	June	-3.40	2
	July	-4.08	2
	August	-4.82	1
1977	May	-2.96	3
	June	-3.28	3
	July	-3.61	3
	August	-3.68	3
1999	May	-3.63	1
	June	-4.21	1
	July	-4.53	1
	August	-4.64	2
other			
1991	May	-1.79	10
	June	-2.10	10
	July	-2.17	10
	August	-3.06	4

Table S4. Individual trait tests of hypothesized drivers of drought resistance, where Rt_{ARIMA} is used as the response variable. Models including each variable were compared to corresponding null models. Delta AICc is the AICc of the null model minus that of the model including the variable (thus, Delta AICc > 1 indicates that the variable significantly improves the model). Variable abbreviations are as in Table 2.

			all droughts		1966		1977		1999	
variable	category	null model variables	dAICc	coefficients	dAICc	coefficients	dAICc	coefficients	dAICc	coefficients
Species traits										
xylem porosity	R	ln[H]*ln[TWI]+crown position (+year)	-5.29	0.0430	0.81	0.1500	2.77**	-0.177	2.51**	0.159
	D/SR			0.0000		0.0000		0.000		0.000
PLA		ln[H]*ln[TWI]+crown position (+year)	-5.06	-0.0120	10.34**	-0.0240	-0.91	-0.009	-1.69	-0.005
LMA		ln[H]*ln[TWI]+crown position (+year)	-12.72	0.0003	-2.05	-0.0005	-0.57	-0.003	-1.9	0.001
π_{tlp}		ln[H]*ln[TWI]+crown position (+year)	-2.54	-0.1530	-1.92	-0.0650	-0.28	-0.201	-0.16	-0.190
WD		ln[H]*ln[TWI]+crown position (+year)	-3.94	-0.0390	-0.2	-0.2970	-1.69	-0.133	0.74	0.313

**ΔAICc > 2: variable considered significant as an individual predictor

Table S5. Summary of top full models for each drought instance, where Rt_{ARIMA} is used as the response variable. Models are ranked by AICc, and we show all models whose AICc value falls within 1.0 (Delta AICc<1) of the best model (bold).

							crown position						
drought	dAICc	R^2	Intercept	$ln[H]$	$ln[TWI]$	$ln[H] * ln[TWI]$	D	C	I	S	PLA	π_{tlp}	
all	**0.00**	**0.09**	**1.132**	**-0.296**	**-0.494**	**0.136**	**-0.015**	**0**	**-0.012**	**0.013**	**-0.012**	**-**	
1966	**0.00**	**0.23**	**1.844**	**-0.193**	**-0.165**	**0.040**	**0.005**	**0**	**0.011**	**0.058**	**-0.024**	**-**	
1977	**0.00**	**0.18**	**1.731**	**-0.384**	**-0.870**	**0.241**	**-0.069**	**0**	**0.016**	**0.103**	**-**	**-0.201**	
	0.63	0.18	2.326	-0.382	-0.867	0.240	-0.071	0	0.014	0.098	-0.009	-	
1999	**0.00**	**0.20**	**1.128**	**-0.175**	**-0.330**	**0.087**	**0.012**	**0**	**-0.034**	**-0.048**	**-**	**-0.188**	**-**

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R Core Team. 2020. *R: A Language and Environment for Statistical Computing*. Vienna, Austria: R Foundation for Statistical Computing. https://www.R-project.org/.

Wickham, Hadley. 2019. *Stringr: Simple, Consistent Wrappers for Common String Operations*. https://CRAN.R-project.org/package=stringr.

Xie, Yihui. 2020. *Knitr: A General-Purpose Package for Dynamic Report Generation in R*. https://CRAN.R-project.org/package=knitr.

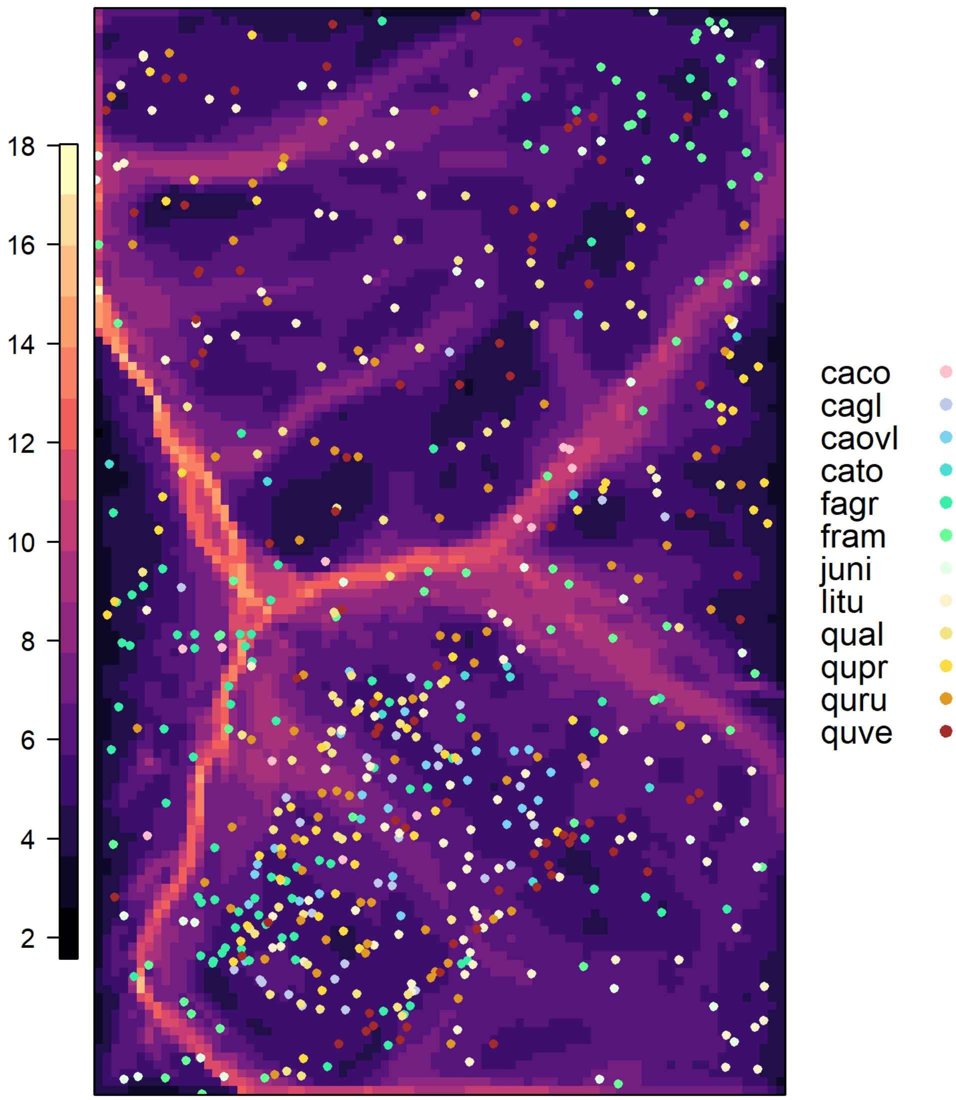

Figure S1: Map of ForestGEO plot showing TWI and location of cored trees

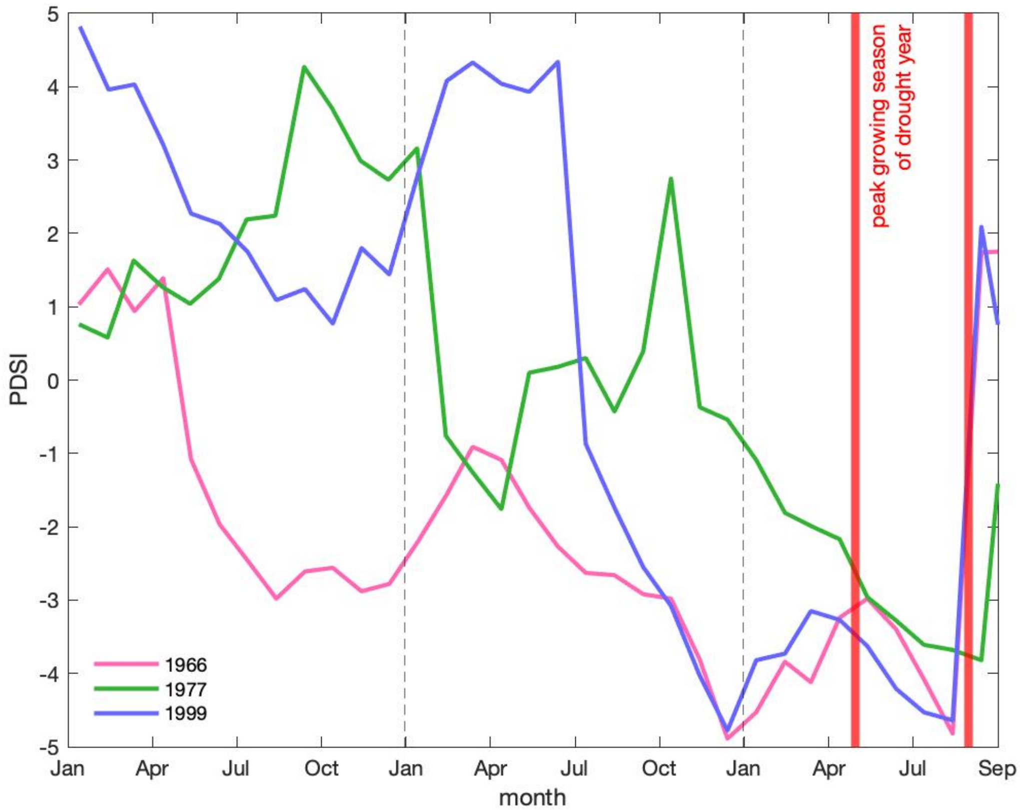

Figure S2: Time series of Palmer Drought Severity Index (PDSI) for the 2.5 years prior to each focal drought

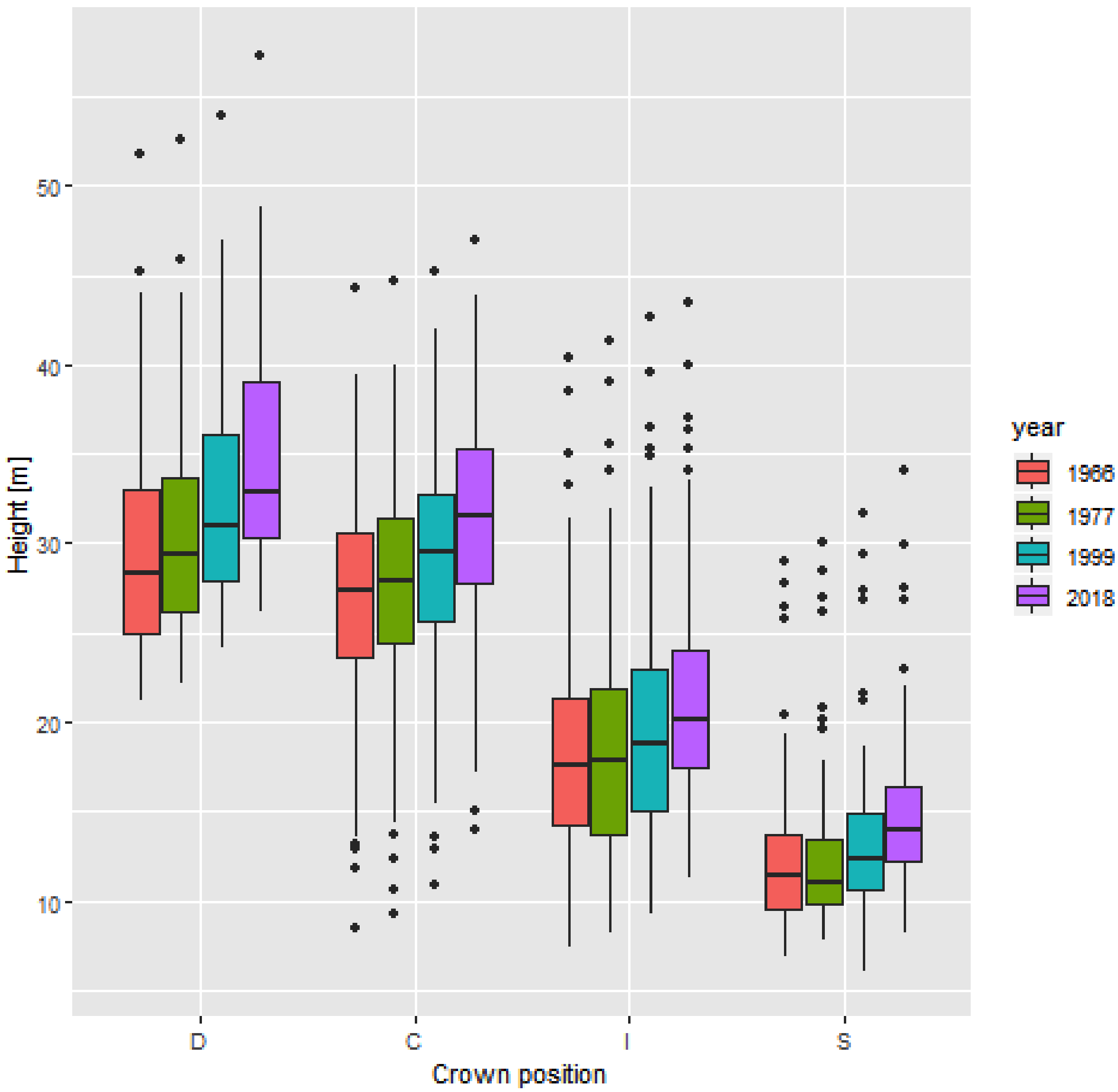

Figure S3: Height by canopy position across the three focal droughts and in the year of measurement (2018)

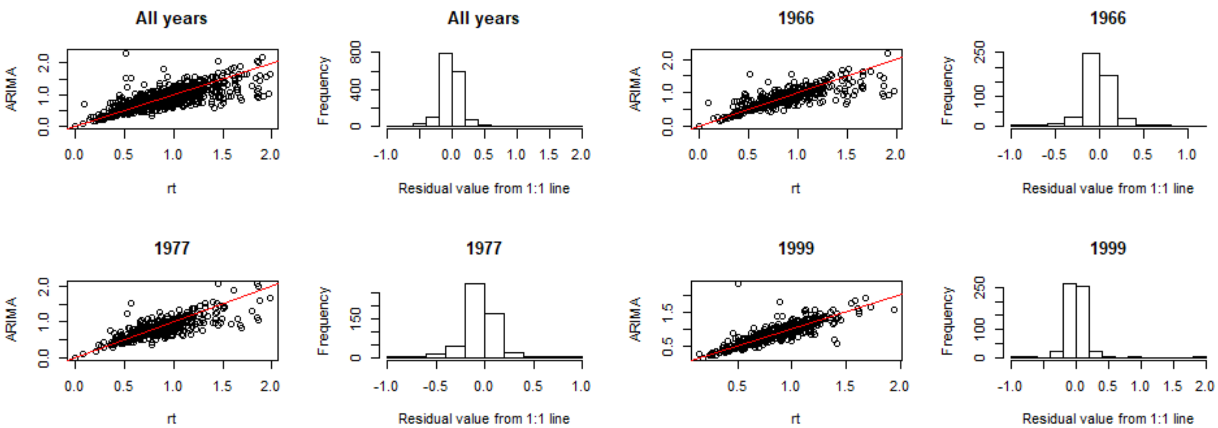

Figure S4: Comparison of Rt and ARIMA results, with residuals, for each drought scenario